CHAPTER SEVEN

TRANSMISSION AND INTERNAL SHIFT MECHANISM

A five-speed transmission with reverse is used on all models. Transmission service requires engine removal and splitting the crankcase (Chapter Five).

Table 1 lists transmission gear ratios. **Tables 2-5** list transmission and shift fork service specifications. **Tables 1-5** are located at the end of this chapter.

TRANSMISSION/REVERSE SYSTEM IDENTIFICATION

This chapter describes service to the forward and reverse transmission assemblies identified in **Figure 1**.

1. Mainshaft (A).
2. Countershaft (B).
3. Reverse idle gear shaft (C).
4. Shift fork shaft and shift forks (D).
5. Shift drum (E).

TRANSMISSION TROUBLESHOOTING

Refer to Chapter Two.

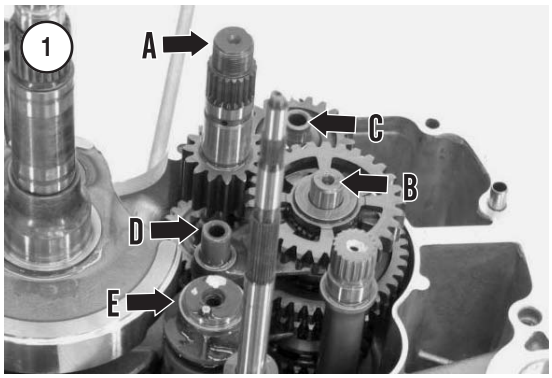
TRANSMISSION OVERHAUL

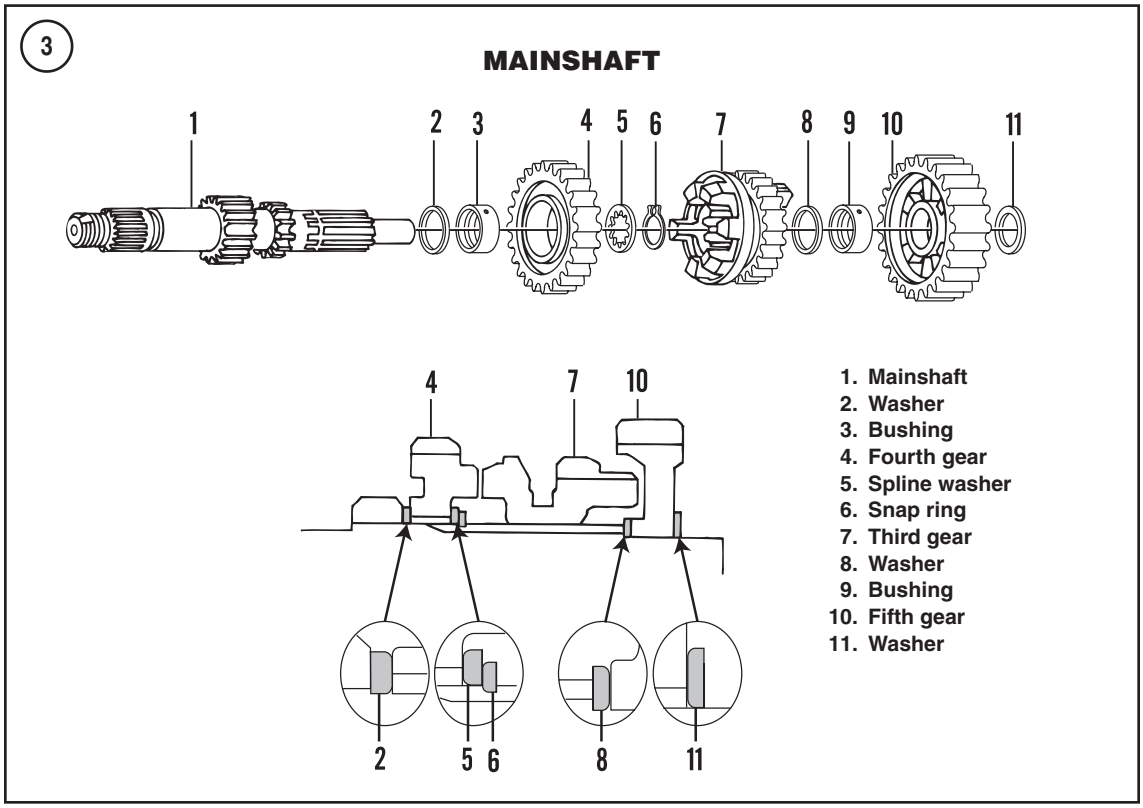
Removal/Installation

Remove and install the transmission and internal shift assemblies as described under *Crankcase Disassembly* and *Crankcase Assembly* in Chapter Five.

Service Notes

1. Parts with two different sides, such as gears, snap rings and shift forks, can be installed backward. To maintain the correct alignment and position of the parts during disassembly, store each part in order and in a divided container.
2. The mainshaft snap ring is a tight fit on the shaft and can bend and twist during removal. Install a new snap ring during assembly.
3. To prevent bending and twisting the new snap ring during installation, use the following installation technique: open the new snap ring with a pair of snap ring pliers while holding the back of the snap ring with a pair of pliers (**Figure 2**), then slide the snap ring down the shaft and seat it into its correct transmission groove.





Mainshaft Disassembly/Assembly

Refer to **Figure 3**.

1. Clean and dry the assembled mainshaft (**Figure 4**).
2. Remove the washer.
3. Remove fifth gear and the bushing.
4. Remove the washer.
5. Remove third gear.
6. Remove the snap ring and spline washer. Discard the snap ring.

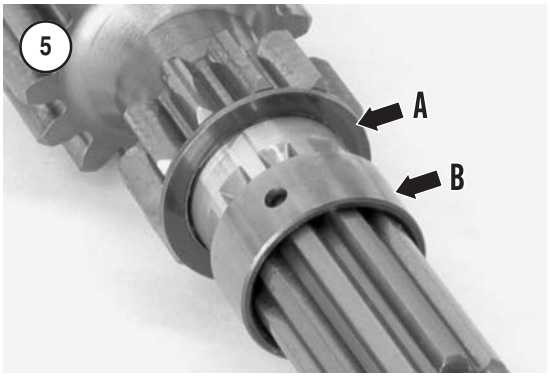
7. Remove fourth gear and the bushing.
8. Remove the washer.

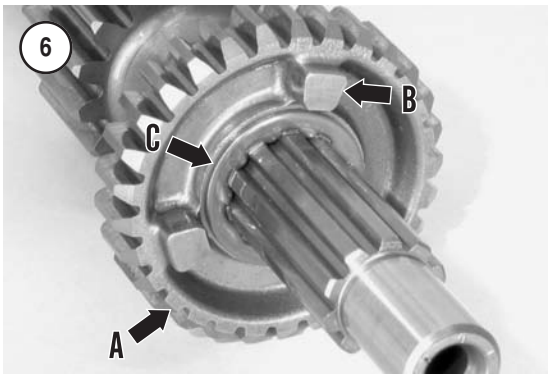
NOTE
Mainshaft second and first gears are an integral part of the mainshaft.

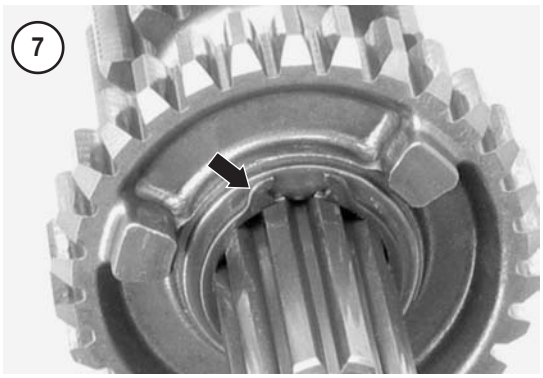
9. Inspect the mainshaft assembly as described under *Transmission Inspection* in this chapter.
10. Lubricate all sliding surfaces with engine oil.
11. Install the flat washer (A, **Figure 5**) and the fourth gear bushing (B).
12. Install fourth gear (A, **Figure 6**) onto the bushing. The gear dogs on fourth gear (B, **Figure 6**) must face toward the end of the shaft.

NOTE
*In Steps 13 and 14, install the spline washer and snap ring with the flat edge facing away from fourth gear as shown in **Figure 3**.*

13. Install the spline washer (C, **Figure 6**).
14. Install a new snap ring (**Figure 7**). Seat the snap ring in the groove next to fourth gear. Align the snap ring gap with the shaft groove (**Figure 8**).
15. Install third gear so the gear teeth (A, **Figure 9**) are toward the end of the shaft.
16. Install the washer (B, **Figure 9**) so the flat side faces away from the fifth gear as shown in **Figure 3**. Install the fifth gear bushing (C, **Figure 9**).
17. Install the fifth gear (A, **Figure 10**). Install the fifth gear so the flat side faces the end of the shaft. Install the washer (B, **Figure 10**) so the flat side faces away from the fifth gear as shown in **Figure 3**.

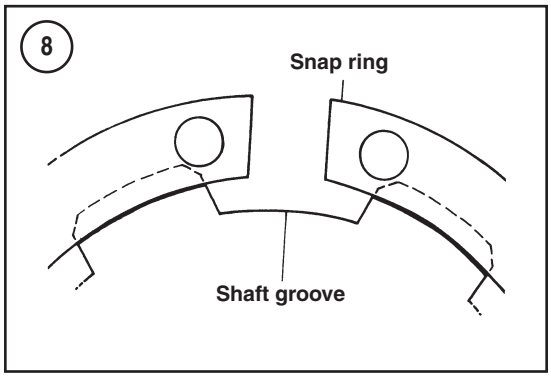


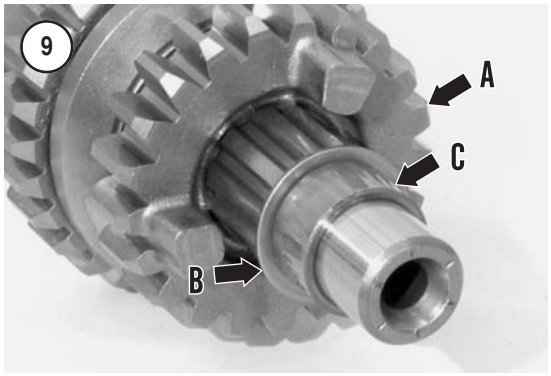




Countershaft Disassembly/Assembly

Refer to **Figure 11**.
1. Clean and dry the assembled countershaft (**Figure 12**).
2. A number of parts on the countershaft are symmetrical. This means they can be installed with either side facing in either direction. However, on a well-used transmission, a wear pattern will have developed on some of these parts. To prevent excessive wear or transmission noise after reassembling the transmission, mark the following parts with a grease pencil so they can be installed facing in their original operating positions.
   a. Spline bushing.
   b. Spline collar.
   c. Spline bushing.
   d. Spline bushing.
   e. Bushing.
3. Remove the washer and fifth gear.
4. Remove the washer, second gear and bushing.
5. Remove the reverse shifter, spline collar, reverse gear and spline bushing.
6. Disengage and remove the lockwasher and spline washer.





7. Remove first gear and the spline bushing.
8. Remove the spline washer, snap ring and fourth gear.
9. Remove the snap ring, spline washer, third gear and bushing.
10. Inspect the countershaft assembly as described under *Transmission Inspection* in this chapter.
11. Lubricate all sliding surfaces with engine oil.
12. When installing the parts listed in Step 2, install them so they face in their original operating position. Refer to the marks made on the parts during disassembly.
13. Install third gear (**Figure 13**) and the bushing onto the countershaft. The dog-side of the gear must be toward the long splined end of the shaft.

NOTE
*In Step 14, install the spline washer and snap ring so the flat edge faces away from third gear as shown in **Figure 11**.*

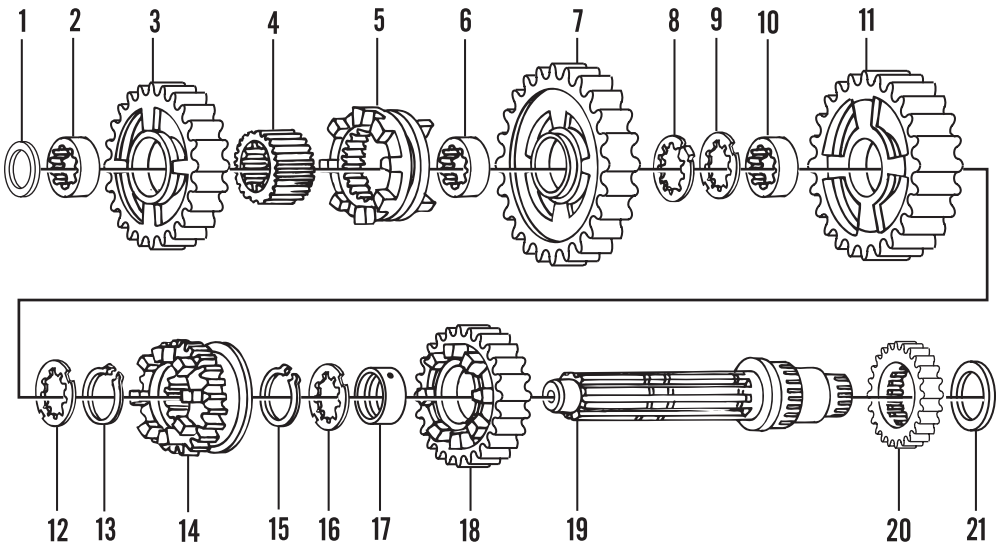
14. Install the splined washer (A, **Figure 14**) and snap ring (B). Align the snap ring gap with the shaft groove (**Figure 8**).
15. Install the fourth gear so the gear teeth (**Figure 15**) are toward the end of the shaft.

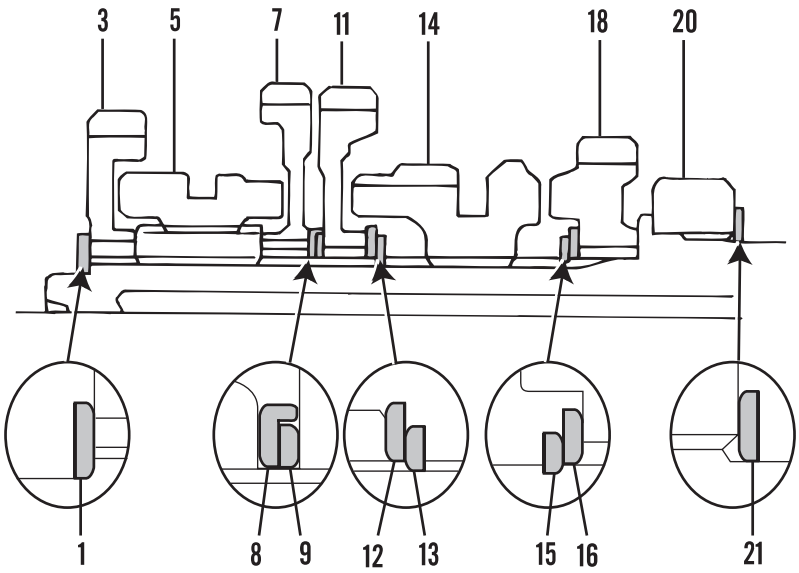
NOTE
*In Steps 16 and 17, install the snap ring and spline washer so the flat edge faces toward fourth gear as shown in **Figure 11**.*

16. Install the snap ring into the shaft groove (**Figure 16**). Align the snap ring gap with the shaft groove (**Figure 8**).
17. Install the spline washer (A, **Figure 17**).
18. Install the spline bushing so the oil hole in the bushing (B, **Figure 17**) aligns with the oil hole in the shaft (C).
19. Install first gear (D, **Figure 17**) so the flat side is toward the end of the shaft.
20. Install the spline washer (A, **Figure 18**) so the side with the rounded edge contacts the gear as shown in **Figure 11**. Install the lockwasher (B, **Figure 18**) so the tabs (C) fit into the notches (D) in the spline washer.
21. Install the spline bushing and reverse gear (**Figure 19**). Make sure the oil hole in the bushing aligns with the oil hole in the shaft. Install the reverse gear so the flat side is toward first gear.
22. Install the spline collar (A, **Figure 20**) and shifter (B). Install the shifter so the side with eight lugs is toward the end of the shaft.
23. Install the spline bushing (C, **Figure 20**) and second gear (D). Make sure the oil hole in the bushing aligns with the oil hole in the shaft. Install the second gear so the flat side is toward the end of the shaft.
24. Install the washer so the rounded edge is toward the gear (**Figure 21**) as shown in **Figure 11**.

11

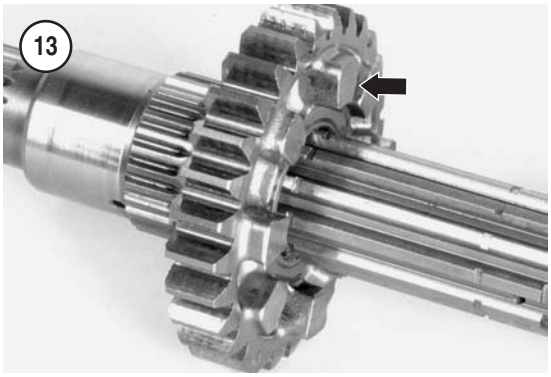
COUNTERSHAFT





1. Washer
2. Spline bushing
3. Second gear
4. Spline collar
5. Shifter
6. Spline bushing
7. Reverse gear
8. Lockwasher
9. Spline washer
10. Spline bushing
11. First gear
12. Spline washer
13. Snap ring
14. Fourth gear
15. Snap ring
16. Spline washer
17. Bushing
18. Third gear
19. Countershaft
20. Fifth gear
21. Washer


12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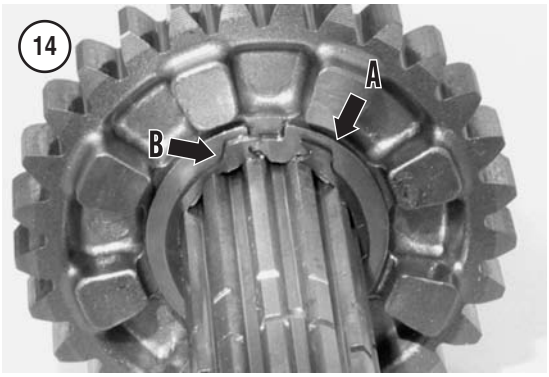
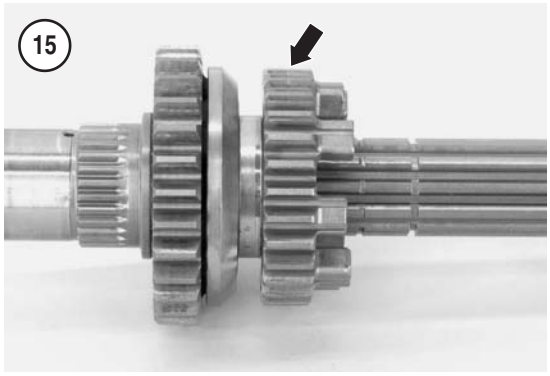

14
A
B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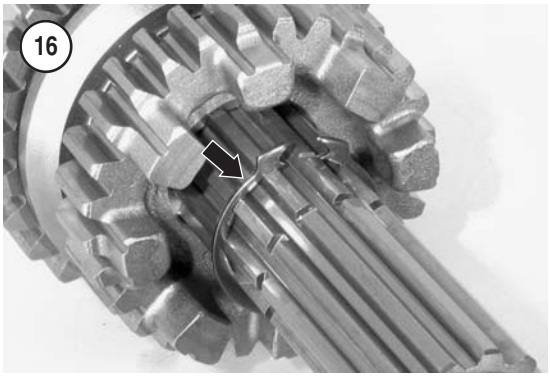
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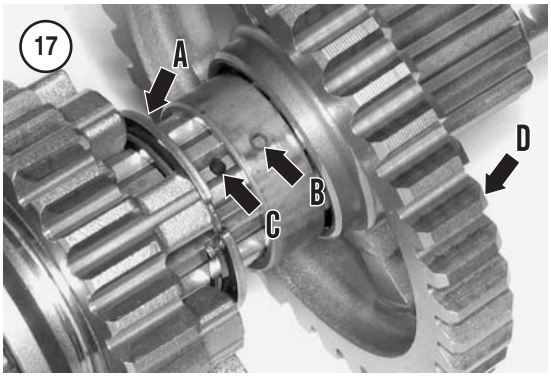
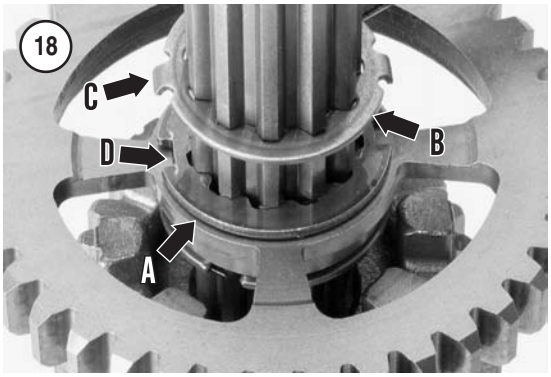

17
A
B
C
D


18
C
D
A
B


19

25. Install the first gear so the splined portion of the inside diameter is toward the end of the shaft (**Figure 22**).
26. Install the washer (**Figure 23**) so the rounded edge is toward the gear as shown in **Figure 11**.
27. Set the countershaft aside until transmission is installation (Chapter Five).

REVERSE IDLE GEAR ASSEMBLY

Removal/Installation/Inspection

Remove and install the reverse idle gear assembly (**Figure 24**) as described in *Crankcase and Crankshaft* in Chapter Five.

Inspect the reverse idle gear assembly as described in *Transmission Inspection* in this chapter.

TRANSMISSION INSPECTION

Mainshaft

Refer to **Table 2** when measuring the mainshaft components (**Figure 3**) in this section. Replace parts that are out of specification or damaged. When replacing a gear, also replace its mating gear, even though it may not show as much wear or damage.

1. Clean and dry the mainshaft assembly.
2. Inspect the mainshaft (**Figure 25**) for:
   a. Worn or damages splines.
   b. Missing, broken or chipped first (A, **Figure 25**) and second (B) gear teeth.
   c. Excessively worn or damaged bearing surfaces.
   d. Cracked or rounded-off snap ring groove.
3. Check each mainshaft gear for:
   a. Missing, broken or chipped teeth.
   b. Worn, damaged or rounded gear lugs.
   c. Worn or damaged splines.
   d. Cracked or scored gear bore.
4. Check each mainshaft bushing for:
   a. Excessively worn or damaged bearing surface.
   b. Worn or damaged splines.
   c. Cracked or scored gear bore.
5. Measure the mainshaft outside diameter at the fourth (C, **Figure 25**) and fifth (D) gear operating positions and record the dimensions.